Replacement of Bus Purchase Transportation Control Measure with Regional Signal Synchronization Transportation Control Measure

Introduction

The Orange County Transportation Authority previously committed to funding of the purchase of an additional 71 buses by June 2014 (ORA041501) in support of increased bus service as a single transportation control measure (TCM). Due to financial pressures, the implementation of this bus purchase and service expansion TCM is recommended to be replaced. For air quality conformity purposes, OCTA is proposing signal synchronization along ten regional corridors (regional signal synchronization) as a single replacement TCM to the previously planned bus purchase TCM in the Federal Transportation Improvement Program. The project description and air quality modeling results are discussed below.

Project Description

The regional signal synchronization TCM consists of the following set of corridors listed below and graphically illustrated in Attachment A.

- Crown Valley Parkway
- Goldenwest Street
- Marguerite Parkway
- Talbert Avenue/MacArthur Boulevard
- Warner Avenue
- Bastanchury Road
- Jamboree Road
- Lambert Road
- Lincoln Avenue/Nohl Ranch Road
- Euclid Street

Synchronized signal timing will be implemented on all the listed corridors. The regional signal synchronization TCM includes 102 miles of roadway, 355 signalized intersections, and will be completed by June 2014 with equivalent air quality benefits to the region.

Compliance with Substitution Requirements

- Equivalent Emissions Reduction: OCTA has analyzed the countywide emissions impacts of the substitute TCM (regional signal synchronization) and concluded that it provides equal or greater emission reductions to the original TCM. See the Air Quality Analysis Methodology below.

- Similar Geographic Area: Both the bus purchase and service expansion TCM and the regional signal synchronization TCM are located in the Orange County portion of the South Coast Air Basin.

- Full Funding: OCTA has current funding from Measure M2 and local agency in an amount of over $6 million for the regional signal synchronization TCM.

- Similar Time Frame: The proposed regional signal synchronization TCM will be operational by June 2014, equivalent to the schedule of the bus purchase and service expansion TCM schedule.

- Timely Implementation: The proposed substitution is the means by which the obstacle to implementation of the bus purchase and service expansion TCM is being overcome.

- Legal Authority: OCTA has legal authority to fund and/or implement the substitute regional signal synchronization TCM.

Air Quality Analysis Methodology

The air quality impacts of the projects were calculated with the proposed regional signal synchronization TCM using a multi-step method based on the SCAG emission methodology focused on Orange County. The following process was used:

Step 1: Obtain daily vehicle miles traveled (VMT) and speed data for freeways and arterials from Orange County Transportation Analysis Model (OCTAM). OCTAM is a conventional transportation model used to forecast travel demand with a forecast year of 2035. It is consistent with SCAG's regional model as it incorporates the most recent socio-economic data for Orange County and the surrounding region. Each alternative was modeled separately using OCTAM and post-processed using the NCHRP 255 process. This process provides a standard methodology to refine forecasted volumes on links based on a combination of base year traffic counts, base year model estimates, and forecasted model estimates using incremental adjustments. The output of the travel demand model and post-processing included travel information on both the bus purchase and service expansion TCM and regional signal synchronization TCM. Loaded link information, intrazonal travel speeds, and intrazonal travel volumes were extracted for all modeled time periods for both alternatives.

The coding of both TCM's was consistent with previous OCTAM modeling practices. This included modeling additional bus routes and increased bus frequency on established routes. On local streets and roads, OCTAM includes freeflow speeds that reflect a combination of classification of the roadway along with delays associated traffic signals, driveways and other impediments. To reflect the implementation of the signal synchronization, these freeflow travel speeds were

increased by five percent to represent the impact of signal coordination on that roadway.

Step 2: Run the SCAG emissions program for the base and forecast year 2035 using the extracted information from Step 1 as input to obtain vehicle starts, VMT, and vehicle population data. The program automatically updates all required inputs to reflect the OCTAM runs and produces files that are input to the California Air Resources Board Emission Factors (EMFAC) model. EMFAC is used throughout California to calculate emission rates from motor vehicles, such as passenger cars and heavy-duty trucks, operating on freeways and local roads for typical summer, winter, and annual conditions. EMFAC provides an estimate of the level of exhaust emissions (via Reactive Organic Gases [ROG] and Nitrogen Oxides [NOx]) for all Orange County. Note that interpolation between base and forecast year 2035 results was used to estimate the emissions changes for both interim years 2014 and 2023.

Step 3: Using the emissions output from Step 2 (see Attachments) to identify the potential emissions-related impacts of the bus purchase and service expansion TCM and regional signal synchronization TCM.

Findings

The air quality forecasts for the bus purchase and service expansion TCM were compared with those of the regional signal synchronization TCM using the methodology described in the previous section. Three forecast years - 2014, 2023, and 2035 – as well as three conditions – summer, winter, and annual – were compared and their results follow in the tables below.

2014 Comparison of Bus Purchase and Service Expansion TCM
and Regional Signal Synchronization TCM
(in daily U.S. tons for Orange County)

		Bus Purchase and Service Expansion TCM	Regional Signal Synchronization TCM
ROG	Summer	38.6	38.6
ROG	Annual	38.7	38.7
NOx	Summer	69.9	69.9
NOx	Winter	77.0	77.0
NOx	Annual	70.7	70.7
CO	Summer	365.0	365.0
CO	Winter	368.4	368.3
CO	Annual	373.3	373.3
PM10	Summer	4.3	4.3
PM10	Annual	4.3	4.3
PM2.5	Summer	2.9	2.9
PM2.5	Annual	2.9	2.9

2023 Comparison of Bus Purchase and Service Expansion TCM
and Regional Signal Synchronization TCM
(in daily U.S. tons for Orange County)

		Bus Purchase and Service Expansion TCM	Regional Signal Synchronization TCM
ROG	Summer	28.6	28.6
ROG	Annual	28.6	28.6
NOx	Summer	48.6	48.6
NOx	Winter	53.3	53.3
NOx	Annual	49.1	49.1
CO	Summer	255.6	255.5
CO	Winter	257.2	257.2
CO	Annual	260.7	260.7
PM10	Summer	4.4	4.4
PM10	Annual	4.4	4.4
PM2.5	Summer	2.9	2.9
PM2.5	Annual	2.9	2.9

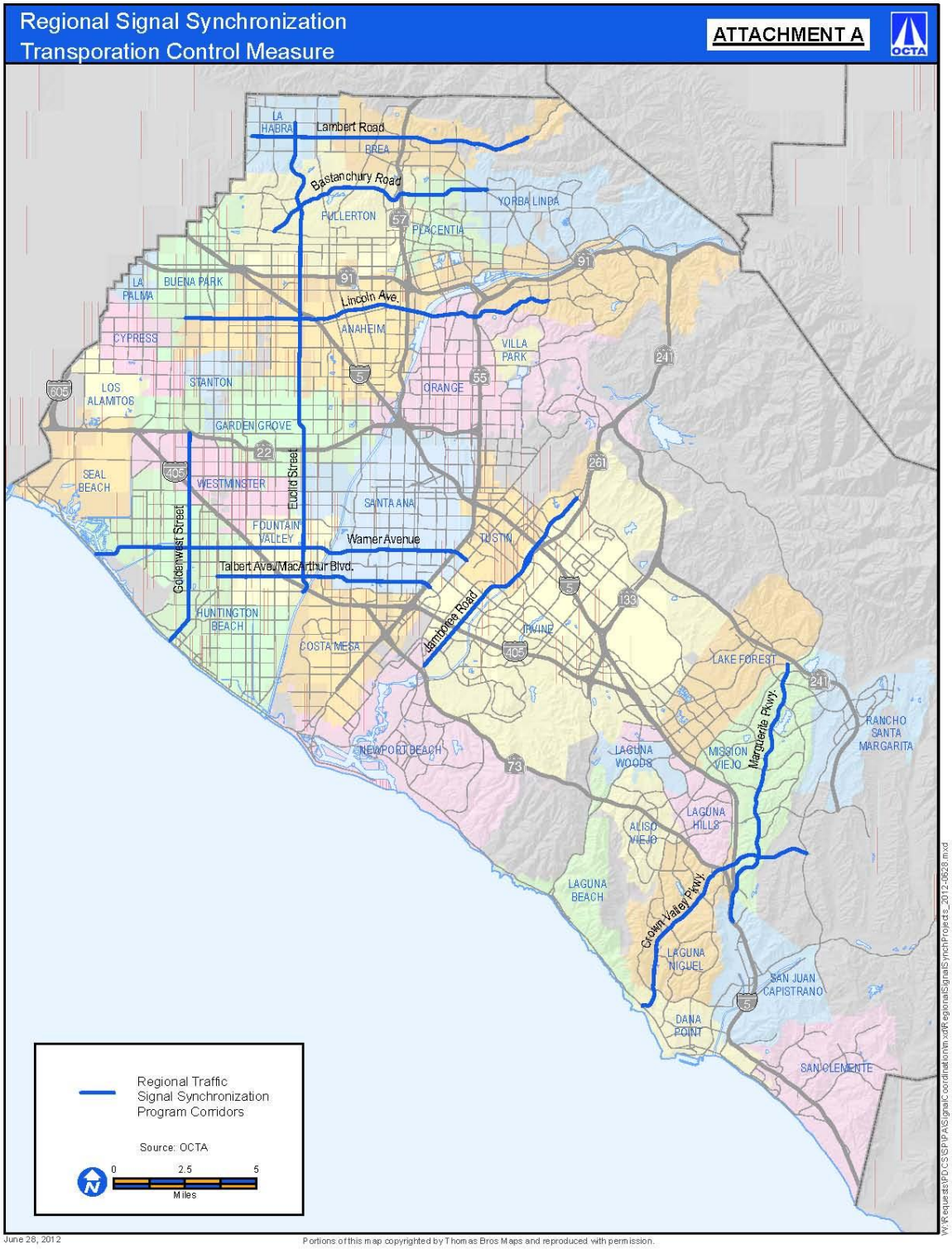
2035 Comparison of Bus Purchase and Service Expansion TCM
and Regional Signal Synchronization TCM
(in daily U.S. tons for Orange County)

		Bus Purchase and Service Expansion TCM	Regional Signal Synchronization TCM
ROG	Summer	15.4	15.4
ROG	Annual	15.1	15.1
NOx	Summer	20.2	20.2
NOx	Winter	21.7	21.7
NOx	Annual	20.3	20.3
CO	Summer	109.6	109.6
CO	Winter	108.9	108.9
CO	Annual	110.5	110.5
PM10	Summer	4.5	4.5
PM10	Annual	4.5	4.5
PM2.5	Summer	2.9	2.9
PM2.5	Annual	2.9	2.9

The results indicate that the proposed regional signal synchronization TCM will have equivalent or greater air quality benefits to the bus purchase and service expansion TCM in Orange County and the region.

Attachments

A. Regional Signal Synchronization TCM Map
B. 2014 Bus Purchase and Service Expansion TCM Emissions Results
C. 2014 Regional Signal Synchronization TCM Emissions Results
D. 2023 Bus Purchase and Service Expansion TCM Emissions Results
E. 2023 Regional Signal Synchronization TCM Emissions Results
F. 2035 Bus Purchase and Service Expansion TCM Emissions Results
G. 2035 Regional Signal Synchronization TCM Emissions Results
H. Southern California Association of Governments TIP Sheet for ORA041501


Regional Signal Synchronization
Transporation Control Measure
ATTACHMENT A
OCTA
LA HABRA
Lambert Road
BREA
Bastanchury Road
YORBA LINDA
FULLERTON
PLACENTIA
LA PALMA
BUENA PARK
Lincoln Ave.
ANAHEIM
CYPRESS
VILLA PARK
LOS ALAMITOS
STANTON
ORANGE
GARDEN GROVE
SEAL BEACH
WESTMINSTER
Euclid Street
SANTA ANA
Goldenwest Street
FOUNTAIN VALLEY
Warner Avenue
TUSTIN
Talbert Ave./MacArthur Blvd.
HUNTINGTON BEACH
Jamboree Road
IRVINE
COSTA MESA
LAKE FOREST
RANCHO SANTA MARGARITA
Marguerite Pkwy.
NEWPORT BEACH
LAGUNA WOODS
MISSION VIEJO
LAGUNA HILLS
ALISO VIEJO
LAGUNA BEACH
Crown Valley Pkwy.
LAGUNA NIGUEL
SAN JUAN CAPISTRANO
DANA POINT
SAN CLEMENTE
Regional Traffic Signal Synchronization Program Corridors
Source: OCTA
0
2.5
5
Miles
W:\Requests\PDCS\SP\PA\SignalCoordination\mxd\RegionalSignalSynchProjects_2012-0628.mxd
June 28, 2012
Portions of this map copyrighted by Thomas Bros Maps and reproduced with permission.

ATTACHMENT B

2014 Bus Purchase and Service Expansion TCM Emissions Results

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2014
Season : Summer
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG Total	32.9	5.3	0.4	38.6
NOx	31.0	35.4	3.5	69.9
PM10	3.0	1.2	0.1	4.3
PM2.5	1.8	1.0	0.1	2.9
CO	317.5	41.5	6.0	365.0

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2014
Season : Winter
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
NOx	35.4	37.8	3.8	77.0
CO	317.0	45.2	6.2	368.4

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2014
Season : Annual
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	32.7	5.6	0.4	38.7
NOx	32.0	35.2	3.5	70.7
PM10	3.0	1.2	0.1	4.3
PM2.5	1.8	1.0	0.1	2.9
CO	322.1	45.0	6.2	373.3

ATTACHMENT C

2014 Regional Signal Synchronization TCM Emissions Results

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2014
Season : Summer
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	32.9	5.3	0.4	38.6
NOx	31.0	35.4	3.5	69.9
PM10	3.0	1.2	0.1	4.3
PM2.5	1.8	1.0	0.1	2.9
CO	317.5	41.5	6.0	365.0

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2014
Season : Winter
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
NOx	35.4	37.8	3.8	77.0
CO	316.9	45.2	6.2	368.3

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2014
Season : Annual
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	32.7	5.6	0.4	38.7
NOx	32.0	35.2	3.5	70.7
PM10	3.0	1.2	0.1	4.3
PM2.5	1.8	1.0	0.1	2.9
CO	322.0	45.1	6.2	373.3

ATTACHMENT D

2023 Bus Purchase and Service Expansion TCM Emissions Results

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2023
Season : Summer
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	24.5	3.8	0.3	28.6
NOx	20.4	25.1	3.1	48.6
PM10	3.4	0.9	0.1	4.4
PM2.5	2.1	0.7	0.1	2.9
CO	223.1	28.4	4.1	255.6

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2023
Season : Winter
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
NOx	23.3	26.7	3.3	53.3
CO	221.8	31.2	4.2	257.2

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2023
Season : Annual
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	24.3	4.0	0.3	28.6
NOx	21.1	25.0	3.0	49.1
PM10	3.4	0.9	0.1	4.4
PM2.5	2.1	0.7	0.1	2.9
CO	225.5	31.0	4.2	260.7

ATTACHMENT E

2023 Regional Signal Synchronization TCM Emissions Results

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2023
Season : Summer
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	24.5	3.8	0.3	28.6
NOx	20.4	25.1	3.1	48.6
PM10	3.4	0.9	0.1	4.4
PM2.5	2.1	0.7	0.1	2.9
CO	223.0	28.4	4.1	255.5

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2023
Season : Winter
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
NOx	23.3	26.7	3.3	53.3
CO	221.8	31.2	4.2	257.2

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2023
Season : Annual
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	24.3	4.0	0.3	28.6
NOx	21.1	25.0	3.0	49.1
PM10	3.4	0.9	0.1	4.4
PM2.5	2.1	0.7	0.1	2.9
CO	225.5	31.0	4.2	260.7

ATTACHMENT F

2035 Bus Purchase and Service Expansion TCM Emissions Results

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2035
Season : Summer
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG Total	13.3	1.9	0.2	15.4
NOx	6.3	11.4	2.5	20.2
PM10	3.8	0.6	0.1	4.5
PM2.5	2.4	0.4	0.1	2.9
CO	97.1	11.0	1.5	109.6

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2035
Season : Winter
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
NOx	7.2	11.8	2.7	21.7
CO	94.9	12.5	1.5	108.9

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2035
Season : Annual
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	12.9	2.0	0.2	15.1
NOx	6.5	11.4	2.4	20.3
PM10	3.8	0.6	0.1	4.5
PM2.5	2.4	0.4	0.1	2.9
CO	96.7	12.3	1.5	110.5

ATTACHMENT G

2035 Regional Signal Synchronization TCM Emissions Results

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2035
Season : Summer
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG Total	13.3	1.9	0.2	15.4
NOx	6.3	11.4	2.5	20.2
PM10	3.8	0.6	0.1	4.5
PM2.5	2.4	0.4	0.1	2.9
CO	97.1	11.0	1.5	109.6

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2035
Season : Winter
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
NOx	7.2	11.8	2.7	21.7
CO	94.9	12.5	1.5	108.9

Version : Emfac2007 V2.3 Nov 1 2006 ** WIS Enabled **
Scen Year : 2035
Season : Annual
I/M Stat : Enhanced Interim (2005)
Emissions : Tons per Period

ON-ROAD EMISSIONS

VRIABLS	L & MDV	HDV	OTHER	ALL VEHICLE
ROG	12.9	2.0	0.2	15.1
NOx	6.5	11.3	2.5	20.3
PM10	3.8	0.6	0.1	4.5
PM2.5	2.4	0.4	0.1	2.9
CO	96.7	12.3	1.5	110.5

ATTACHMENT H

Southern California Association of Governments TIP Sheet for ORA041501

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

Project Sheet

2011 FTIP (FY 2010/2011 - FY 2015/2016)
Federal Approved
Cost in Thousands

Project ID	ORA041501	County: Orange		Version:	1	Amendment	3
Agency	ORANGE COUNTY TRANS AUTHORITY (OCTA)						
System	T					CTC Update	3/8/2011 9:20 AM
		Conform Cat.	TCM Committed			by	Gutierrez
		Air Basin	SCAB			SCAG Update	
Phase	Bid/Advertise Phase					by	
Program Code:	BUR17 BUSES-REPLACEMENT-ALTERNATIVE FUEL					RTP ID	ORA041501
Scheduled Dates	Starting	Ending	Completion Date:			CTIPS ID	20930001479
PAED			6/30/2016			Model No.	
PS&E(ENG)			Conformity Category:			Env. Doc. Type	CE
ROW			TCM Committed			Env. Doc. Date	
CON			Current Project Status:			Year Added	0
			Federal Approved (as of 3/8/2011 9:20:07 AM)				
Change Reason:	FUND CHG						
Project Description:						Project Total Cost:	8,998

PURCHASE (71) STANDARD 30FT EXPANSION BUSES - ALTERNATIVE FUEL - (31) IN FY08-09, (9) IN FY09-10, (7) IN FY11-12, (6) IN FY12-13 AND (18) IN FY13-14

Fund Type	Fiscal Year	ENG	ROW	CON	Fund Total
	2010/2011			5,351	5,351
	2011/2012			3,647	3,647
TDA				8,998	8,998
Total				8,998	8,998

Comments

tcm 2011 FTIP Timely Implementation Status - no change Project moving forward consistent with schedule. Ongoing